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(NASA-CR-118568) APOLLO GSE END ITEM SPECIFICATION FOR NOZZLE SIMULATOR, FIREABLE, ASSEMBLY OF MODEL A14-208 (North American Aviation, Inc.) 11 p

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SID 64-1834

APOLLO GSE END ITEM SPECIFICATION

FOR

NOZZLE SIMULATOR - FIREABLE, ASSEMBLY OF

MODEL A14-208
(U)

12 January 1965

Contract NAS 9-150

Exhibit I, Paragraph 4.2

CLASSIFICATION CHANGE
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[redacted]

NORTH AMERICAN AVIATION, INC.
SPACE and INFORMATION SYSTEMS DIVISION

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TECHNICAL REPORT INDEX/ABSTRACT

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ACCESSION NUMBER							DOCUMENT SECURITY CLASSIFICATION	
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TITLE OF DOCUMENT

Apollo GSE End Item Specification for Nozzle Simulator - Fireable, Assembly of Model A14-208

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AUTHOR(S)

N. Simmons

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	NAA/S&ID	SID 64-1834

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14 January 1965	NAS 9-150

DESCRIPTIVE TERMS

Apollo GSE End Item Specification

ABSTRACT

This specification defines the performance, design, and testing requirements for Model A14-208, a unit of Ground Support Equipment for Project Apollo.

GROUP III
DOWNGRADED AT 12 YEAR INTERVALS; NOT AUTOMATICALLY DECLASSIFIED

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APOLLO GSE END ITEM SPECIFICATION

FOR

NOZZLE SIMULATOR - FIREABLE, ASSEMBLY OF

MODEL A14-208

1. SCOPE

1.1 Scope.- This specification establishes the requirements for the Nozzle Simulator - Fireable Assembly, Model A14-208.

2. APPLICABLE DOCUMENTS

2.1 Applicability.- The following documents of the issue specified or, if unspecified, of the latest issue, form a part of this specification to the extent specified herein:

SPECIFICATIONS

Military

MIL-D-70327(2) 27 March 1962	Drawings, Engineering and Associated Lists

[redacted]

[redacted]

National Aeronautics and Space Administration (NASA)

Manned Spacecraft Center (MSC)

MSC-GSE-1B, Rev. 1 23 June 1964	Apollo Ground Support Equipment General Environmental Criteria and Test Specification

North American Aviation, Inc., Space and Information Systems Division (NAA/S&ID)

MA 0208-3501	Moment of Inertia Measurement for the Inertia Simulator, Model A14-208

STANDARDS

Military

MIL-STD-130B 24 April 1962	Identification Marking of U. S. Military Property
MIL-STD-143A 14 May 1963	Specifications and Standards Order of Precedence for the Selection of

DRAWINGS

North American Aviation, Inc., Space and Information Systems Division (NAA/S&ID)

G14-000024	Finish Specification - Apollo Ground Support Equipment
G17-824160	Nozzle Simulator - Fireable, Assy of
MK-392-10194	Support, Handling and Shipping Container - Cone - Inertia Simulator Fireable Assembly of,

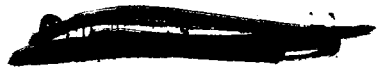
[redacted]

PUBLICATIONS

National Aeronautics and Space Administration (NASA)

NPC 200-2	Quality Assurance Program
20 April 1962	Major Subcontractors

2.2 Precedence.- When the requirements of this specification and those of the documents listed herein are in conflict, the requirements of this specification shall govern.



3. REQUIREMENTS

3.1 Performance.-

3.1.1 Operational Requirements.- The Nozzle Simulator - Fireable Assembly, Model A14-208, hereinafter referred to as the simulator, shall simulate the nozzle extension of the Service Propulsion System (SPS) engine during static firing for exercising the SPS gimbal actuators.

3.1.2 Operations.-

3.1.2.1 Reliability.- Not applicable.

3.1.2.2 Maintainability.- Not applicable.

3.1.2.3 Useful Life.-

3.1.2.3.1 Service Life.- The simulator minimum total service life shall be 275 minutes with a maximum continuous firing duration of 660 seconds and an average pulse duration of 25 seconds.

3.1.2.3.2 Storage Life.- The simulator shall have a storage life of three years.

3.1.2.4 Environments.-

3.1.2.4.1 Transportation, Ground Handling, and Storage.- The simulator shall withstand the natural and induced environments specified in Specification MSC-GSE-1 during transportation, ground handling, and storage.

3.1.2.4.2 Operational Environments.- The simulator shall operate as specified herein while being subjected to the natural and induced environments for operational area codes C, D, and H specified in paragraph 2.4 of Specification MSC-GSE-1.

3.1.2.5 Transportability.- Not applicable.

3.1.2.6 Human Engineering.- Not applicable.

3.1.2.7 Safety .- Not applicable.

[redacted]

3.2 Interface Requirements.-

3.2.1 Schematic Arrangement.- Not applicable.

3.2.2 Detailed Interface Requirements.- The simulator shall interface with the SPS engine nozzle as specified on Drawing G17-824160.

3.3 Design and Construction.-

3.3.1 General Design Features.- The simulator shall be designed as a truncated bell structure allowing the engine to fire through it. The shell of the structure will allow air flow for cooling. The structure will have sufficient stiffness to simulate the Spacecraft nozzle extension. A detachable ring shall be attached to the SPS engine flange in a manner similar to the attachment of the SPS nozzle extension. The cone nozzle assembly of the simulator shall be clamped to the adapter ring with a marmon clamp. The simulator shall be bell shaped and fabricated from stainless steel sheet. Stiffeners shall be located about the periphery of the structure to increase rigidity. Vent holes shall be provided throughout the shell of the simulator.

3.3.1.1 Component Identification.- The simulator shall include the following major components:

(a) Adapter ring
(b) Marmon clamp
(c) Cone nozzle

3.3.1.2 Dimensions and Weight.-

3.3.1.2.1 Dimensions.- The simulator shall have the dimensions specified in Drawing G17-824160.

3.3.1.2.2 Weight.- The simulator shall weigh approximately 269 pounds.

3.3.1.3 Construction.- The simulator shall be constructed in accordance with Drawing G17-824160.

3.3.1.4 First Mode Bending Frequency.- The first mode bending frequency of the simulator shall be 400 radians per second or greater.

[redacted]

[redacted]

3.3.1.5 Pressure.- The pressure across the shell of the simulator shall be equalized by the addition of vent holes which shall equal 10 percent of the nozzle surface area.

3.3.1.6 Deceleration.- The simulator, when mounted on the SPS engine, shall withstand deceleration forces due to snubbing occurring in one degree of arc. The maximum deceleration during gimbaling shall be 15 radians per second squared.

3.3.1.7 Moment of Inertia.- The simulator shall have a moment of inertia of 172.4 slug-ft^2 (+ 2 percent) about the gimbal point of the SPS engine.

3.3.1.8 Operating Temperature.- The simulator shall withstand an operating temperature of 800 degrees Fahrenheit for 660 seconds.

3.3.2 Selection of Specifications and Standards.- The order of precedence for the selection of specifications and standards for the simulator shall be in accordance with Standard MIL-STD-143.

3.3.3 Materials and Processes.-

3.3.3.1 Materials.- Materials used in the construction of the simulator shall be of high quality and suited to the intended use.

3.3.3.2 Processes.- Not applicable.

3.3.4 Standard and Commercial Parts.- NAA/S&ID, MS, AN, JAN, NAS, or MIL standard parts shall be used in the design of the simulator. However, if there is no suitable NAA/S&ID, AN, JAN, NAS, or MIL standard part for a specific application, a commercial part may be used provided the commercial part is suitable for the purpose intended.

3.3.5 Moisture and Fungus Resistance.- Not applicable.

3.3.6 Corrosion of Metal Parts.- Metal parts used in the construction of the simulator shall be corrosion resistant or shall be treated to resist corrosion.

[redacted]

[redacted]

3.3.6.1 Dissimilar Metals.- The use of dissimilar metals in contact shall be avoided. Where unavoidable, dissimilar metals shall be employed in accordance with Drawing G14-000024.

3.3.6.2 Protective Treatment.- Materials that are subject to deterioration when exposed to climatic and environmental conditions specified herein shall be protected against such deterioration in a manner that will in no way prevent compliance with the performance requirements of this specification.

3.3.6.3 Finish.- The finish of the simulator shall be as specified on the applicable detail drawings.

3.3.7 Interchangeability and Replaceability.- The simulator, its parts, equipment, and assemblies having the same part number shall be physically and functionally interchangeable. Part number changes shall meet the drawing number requirements of Specification MIL-D-70327.

3.3.8 Workmanship.- The simulator shall be fabricated and finished so that criteria of appearance, fit, and adherance to specified dimensions and tolerances are observed; and in a manner which will assure satisfactory operation, reliability, and durability in accordance with the requirements specified herein. Particular attention shall be given to the neatness and thoroughness of construction, and especially to the freedom of parts from burrs and sharp edges that might damage associated equipment or cause injury to operating personnel.

3.3.9 Electromagnetic Interference (EMI).- Not applicable.

3.3.10 Identification and Marking.- The simulator shall be marked for identification in accordance with Standard MIL-STD-130.

3.3.11 Storage.- Not applicable.

3.3.12 Traceability.- The simulator shall be exempt from traceability.

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4. QUALITY ASSURANCE PROVISIONS

4.1 General Provisions.- NAA/S&ID shall provide a quality assurance program in accordance with Publication NPC 200-2, as applicable.

4.2 Classification of Tests.- Inspection and testing of the simulator shall be classified as qualification tests and acceptance tests.

4.2.1 Qualification Tests.- Not applicable.

4.2.2 Acceptance Tests.- The simulator shall be subjected to the following acceptance tests:

(a) Examination of product
(b) Moment of inertia test.

4.2.2.1 Examination of Product.- The simulator shall be examined to determine conformance to this specification.

4.2.2.2 Moment of Inertia Test.- The moment of inertia of the simulator shall be determined in accordance with Specification MA 0208-3501, and shall be adjusted, if necessary, to the value specified in 3.3.1.7.

5. PREPARATION FOR DELIVERY

5.1 Preservation, Packaging, and Packing.- The simulator shall be preserved, packaged, and packed in accordance with Packaging Drawing MK-392-10194.

[redacted]

6. NOTES

6.1 Responsibility.- Responsibility for the design and manufacture of the simulator is that of NAA/S&ID (Downey, California).

6.2 Model Interchangeability.- Not applicable.

6.3 Definitions.- Not applicable

6.4 Contract Compliance.- This specification is provided in compliance with the following paragraphs of Exhibit I, Contract NAS 9-150:

Paragraph 4.2 (CFE Specification Requirement)
Paragraph 6.14 (Data Package Requirement).

[redacted]